WHAT IS CLAIMED IS:

1. A light source comprising:

a semiconductor diode laser; and

a reflector having a three-dimensional pattern of refractive index variations within the reflector, the reflector being in optical communication with the semiconductor diode laser and aligned with an output beam of the diode laser, such that a portion of the light in the output beam is reflected back into the laser by the reflector.

2 The light source of claim 1, wherein the reflector is a volume diffractive grating.

3. The light source of claim 1, wherein the reflector in an interference filter.

4. The light source of claim 1 where the reflector is a photonic bandgap crystal.

5. The light source of any of the preceding claims, wherein the diode laser is a multimode diode laser when operated without the reflector.

6. The light source of any of the preceding claims, wherein the reflector is in contact with a facet of the diode laser.

7. The light source of any of the preceding claims, wherein the reflector has a peak reflectivity that is greater than a reflectivity of an output facet of the diode laser.

8. The light source of claim 7, wherein the reflectivity of the reflector and the reflectivity of the output and rear facets of the diode laser are selected to optimize the output power of the light source.

9. The light source of claim 7 or 8, wherein the reflectivity of the output facet is less than about 50%.

10. The light source of claim 7 or 8, wherein the reflectivity of the output facet is less than about 10%.

11. The light source of claim 7 or 8, wherein the reflectivity of the output facet is less than about 3%.

12. The light source of any of the preceding claims, wherein the reflector is in contract with a rear facet of the diode laser.

13. The light source of any of the preceding claims, wherein the reflector is adapted to focus the output beam from the diode laser along a fast axis of the diode laser.

14. The light source of any of the preceding claims, wherein the reflector is adapted for focusing the light from the diode laser along a slow axis of the diode laser.

15. The light source of any of the preceding claims, wherein the reflector is adapted to enhance the gain of a desired lateral mode over the gain of other lateral modes to increase a brightness of the output beam.

16. The laser source of any of the preceding claims, wherein the reflector is adapted to enhance optical feedback to the diode laser in a desired optical mode relative to undesired optical modes.

17. The laser source of claim 16, wherein the optical feedback from the reflector spatially shapes the output beam of the light source to have a square or Guassian profile.

18. The laser source of any of the preceding claims, wherein the reflector has a reflectivity spectral width that is less than 0.2 nm.

19. The laser source of any of the preceding claims, wherein the reflector has a reflectivity spectral width that is less than 0.01 nm.

20. The laser source of any of the preceding claims, wherein the reflector is adapted to provide selective feedback to the diode laser such that a single longitudinal mode is emitted from the light source.

21. The laser source of any of the preceding claims, wherein the reflector is adapted and arranged relative to the diode laser to provide selective feedback to the diode laser such that the sidemode suppression ratio in the light source is greater than -30dB.

22. The laser source of claim 21 wherein the diode laser and reflector are configured in ECL a configuration having a footprint of less than about one square centimeter.

23. The laser source of any of the preceding claims, wherein the reflector is adapted and arranged relative to the diode laser to provide selective feedback to injection lock the wavelength of the output beam from the diode laser.

24. The laser source of any of the preceding claims, wherein the diode laser and the reflector are arranged in an external cavity configuration.

25. The light source of any of claims 1-5 or 7-24, further comprising a lens positioned between the diode laser and the reflector.

26. The light source of claim 25, wherein the lens is adapted for focusing the output beam from the diode laser along a fast axis of the diode laser.

27. The light source of claim 25 or 26, wherein the output beam of the diode laser is substantially perpendicular to the pattern of refractive index variations.

28. The light source of any one of the preceding claims, further comprising multiple diode lasers aligned with respect to the reflector such that a portion of the light emitted from each of the diode lasers is reflected back into the diode laser from which the light is emitted.

29. The light source of claim 28, wherein the lasers are arranged in an array on a single chip.

30. The light source of any of claims 28 or 29, wherein the lasers are arranged in multiple single-chip arrays, and wherein the arrays are stacked on top of each other.

31. The light source of any of the preceding claims, further comprising

a laser active medium that absorbs at least a portion of the output beam and is pumped by the output beam.

32. The light source of claim 31, wherein the laser active medium is an active medium of a rod laser.

33. The light source of claim 31, wherein the laser active medium is an active medium of a disk laser.

34. The light source of claim 31, wherein the laser active medium is an active medium of a fiber laser.

35. A light source comprising:

a first semiconductor diode laser;

a first reflector having a three-dimensional pattern of refractive index variations within the reflector, the first reflector being in optical communication with the first semiconductor diode laser and aligned with an output beam of the first laser such that a portion of the output beam of the first laser is reflected back into the first laser by the first reflector;

a second semiconductor diode laser;

a second reflector having a three-dimensional pattern of refractive index variations within the reflector, the second reflector being in optical communication with the second semiconductor diode laser and aligned with an output beam of the second laser such that a portion of the output beam of the second laser is reflected back into the second laser by the second reflector; and

a first beam combiner adapted and arranged for combining the output beams of the first laser and the second laser.

36. The light source of claim 35, wherein the first beam combiner is external to cavities formed by first diode laser and the first reflector and by the second diode laser and the second reflector.

37. The light source of claim 35 or 36, wherein the first beam combiner is a reflector having a three-dimensional pattern of refractive index variations within the reflector.

38. The light source of any of claims 35-37, wherein the first beam combiner, the first diode laser, and the second diode laser are arranged such that the beams are combined in parallel by the first beam combiner.

39. The light source of any of claims 35-37, wherein the first beam combiner, the first diode laser, and the second diode laser are arranged such that the beams are combined in series by the first beam combiner.

40. The light source of any of claims 35-39, wherein the output beams of the first laser and the second laser have different polarizations.

41. The light source of any of claims 35-40, wherein the output beams of the first laser and the second laser have different wavelengths.

42. The light source of any of claims 35-41, wherein the first beam combiner, the first diode laser, and the second diode laser are arranged such that the beams are combined geometrically.

43. The light source of any of claims 35-42, further comprising:

a third semiconductor diode laser;

a third reflector having a three-dimensional pattern of refractive index variations within the reflector, the third reflector being in optical communication with the third semiconductor diode laser and aligned with an output beam of the third laser such that a portion of the output beam of the third laser is reflected back into the third laser by the third reflector; and

a second beam combiner for combining the output beams of the first laser and the third laser in parallel.